MISB MOTION IMAGERY STANDARDS BOARD	MISB RP 0602.3
RECOMMENDED PRACTICE **Annotation Universal Metadata Set**	**24 October 2013**

1 Scope

This Recommended Practice documents the basic SMPTE KLV metadata to encode Video Annotation data within a motion imagery data stream. This RP also provides direction on the creation of "Annotation" KLV metadata to allow for the creation, dissemination, and display of visual cues to enhance the exploitation of MISP compliant motion imagery data.

2 References

2.1 Normative References

The following references and the references contained therein are normative.

[1] SMPTE ST 336:2007 Data Encoding Protocol Using Key-Length-Value

[2] ISO/IEC 13818-1:2013 Information technology - Generic coding of moving pictures and associated audio information: Systems

[3] MISB ST 0604.2 Time Stamping and Transport of Compressed Motion Imagery and Metadata, Jun 2011

[4] MISB ST 0107.1 Bit and Byte Order for Metadata in Motion Imagery Files and Streams, Jun 2011

[5] MIL-STD-2301A, Computer Graphics Metafile (CGM) Implementation Standard for the National Imagery Transmission Format Standard, 5 Jun 1998

[6] ISO 10918-1, Information technology - Digital compression and coding of continuous-tone still images, 1994

[7] ISO/IEC 15948:2004, Information technology - Computer graphics and image processing - Portable Network Graphics (PNG): Functional specification

[8] SMPTE RP 210.1v13:2012 Metadata Element Dictionary

[9] MISB ST 0807.12 MISB KLV Metadata Dictionary, Oct 2013

[10] ISO/IEC 646:1991, Information Technology – ISO 7-bit Coded Character Set for Information Interchange

3 Modifications and Changes

Revision	Date	Summary of Changes
0602.3	10/24/2013	• Revised to define requirements • Updated References & restructured document • Revised to include Z-order

4 Definitions and Acronyms

AOI Area of Interest
BMP Bit Map Image File
CGM Computer Graphics Metafile
DIB Device Independent Bitmap
IETF Internet Engineering Task Force
JPG Joint Photographic Expert Group
KLV Key-Length-Value
MIME Multipurpose Internet Mail Extension
PNG Portable Network Graphics
VDC Virtual Device Coordinate

5 Introduction

Motion Imagery (video) annotation is the process of visibly providing added information about objects appearing in a motion imagery data stream. Each annotation consists of data which describes an object in the data stream. This annotation object is associated with the subset of frames for which the annotation object is valid. Motion Imagery annotation objects may be added to a MPEG-2 Transport Stream by adding an elementary data stream. A motion imagery data stream is considered annotated when there is an associated stream of encoded video annotation messages.

SMPTE ST 336[1] defines a Key-Length-Value (KLV) metadata encoding protocol for representing data items and data groups independent of the application or data transport method used.

Requirement	
RP 0602.3-01	Motion Imagery/video annotation data shall be implemented as SMPTE ST 336[1] compliant Universal Sets.
RP 0602.3-02	Annotation private data streams shall be multiplexed in accordance ISO/IEC 13818-1[2] and MISB ST 0604[3].
RP 0602.3-03	All metadata shall be expressed in accordance with MISB ST 0107[4].

The multiplexing of an annotation private data stream into an MPEG-2 Transport Stream is outside the intent this document. See ISO/IEC 13818-1 and MISB ST 0604 for details.

6 Motion Imagery (video) Annotation Metadata Elements

A motion imagery annotation elementary data stream is comprised of a sequence of KLV metadata elements.

6.1 Preface Metadata Elements

Requirement	
RP 0602.3-04	When the metadata element Byte Order has not been inserted within an annotation data stream in the previous quarter second of program timeline, it shall be inserted into the annotation stream immediately preceding a Video Annotation Universal Set.
RP 0602.3-05	When the metadata element Active Lines per Frame has not been inserted within an annotation data stream in the previous quarter second of program timeline, it shall be inserted into the annotation stream immediately preceding a Video Annotation Universal Set.
RP 0602.3-06	When the metadata element Active Samples per Frame has not been inserted within an annotation data stream in the previous quarter second of program timeline, it shall be inserted into the annotation stream immediately preceding a Video Annotation Universal Set.

The KLV elements Byte Order, Active Lines per Frame and Active Samples per Line provide ancillary information to aid decoders interpret the Video Annotation Universal Set data that follows. More frequent inclusion of preface items is permitted, and is desirable to enhance random accessibility.

Note the Active Lines per Frame and Active Samples per Line are the pixel array dimensions of the original motion imagery data prior to compression.

6.2 Motion Imagery Annotation Universal Metadata Set

Requirement	
RP 0602.3-07	The Video Annotation Universal Metadata Set key shall be present.
RP 0602.3-08	The Video Annotation Metadata Set shall include the Locally Unique Identifier key.
RP 0602.3-09	The Video Annotation Metadata Set shall include the Event Indication key with a specific event message as defined in MISB RP 0602 Table 1.

6.2.1 Locally Unique Identifier

The Locally Unique Identifier identifies the annotation object with which the annotation message is associated.

6.2.2 Event Indication Messages

The Event Indication defines a specific event described in the message; allowable events are: "NEW", "MOVE", "MODIFY", "DELETE", and "STATUS". The frames for which an annotation object is valid are described by a set of events, each of which occurs at a particular frame of the video. Table 1 lists the available options for Event Indication.

Table 1: Event Indication Messages

Event Indication	Action Effected
NEW	Creates/initiates an annotation object
MOVE	Updates to an annotation object's position within the viewport
MODIFY	Changes to the annotation object's data
STATUS	Periodic messages describing the current contents and location of the annotation object
DELETE	Indicate the termination of the associated annotation object

6.3 Variable Metadata Elements

6.3.1 MIME Media Type

The MIME Media Type describes the MIME Encoding type of the accompanying MIME Data.

6.3.2 MIME Data

The MIME Data contains the MIME encoded data of the annotation message and is restricted to the format defined in its associated reference document (see Table 2).

Table 2: Allowed MIME Media Types and Data Reference

MIME Media Type	MIME Data Reference
image/x-ms-bmp	Device Independent Bitmap (DIB or BMP) file format
image/cgm[1]	MIL-STD-2301A[5]
image/jpeg	ISO 10918-1[6]
image/png	ISO/IEC 15948[7]

[1] Versions of this specification prior to Revision 2 referred to the MIME type for CGM as "cgm", rather than the MIME-standard format of "image/cgm". Decoder implementations that may encounter streams produced in accordance with Revision 1 or prior of this document are advised to look for a MIME type of "cgm" and treat such annotations the same as those with MIME type of "image/cgm". Encoders producing streams in accordance with this specification may not use "cgm" for the MIME media type of any CGM annotation.

Requirement	
RP 0602.3-10	Encoders shall use only MIME Media Types as listed in MISB RP 0602.3 Table 2.
RP 0602.3-11	A decoder shall be capable of decoding all MIME Media Types listed in MISB RP 0602.3 Table 2.

6.3.3 Modification History

The Modification History contains information identifying the author of the most recent significant event such as "NEW", "MODIFY" and "DELETE. The specific contents are user definable.

6.3.4 X and Y Viewport Position in Pixels

The X and Y Viewport Position in Pixels is the location of the MIME Data reference point, typically the image origin, but is defined independently for each data type, per Table 3. The X and Y position is referenced based upon a (0, 0) origin in the upper-left corner of the original essence data image.

Table 3: X and Y Viewport Position in Pixels

MIME Type	Interpretation of X and Y Viewport Position in Pixels
image/x-ms-bmp	Position of lower left corner of BMP within viewport
image/cgm	Origin of the CGM's VDC (Virtual Device Coordinate) within the viewport
image/jpeg	Position of upper left corner of JPEG within viewport
image/png	Position of upper left corner of PNG within viewport

6.3.5 Annotation Source

The Annotation Source key describes the source method of the annotation. This 4-byte bit masked field is only required during a "NEW" and "STATUS" event. Annotation Source mask values are indicated in Table 4.

Table 4: Definition of Annotation Source Mask Values

Mask Value	Definition
0x0000	Manually Annotated
0x0001	Automated from BE/RWAC
0x0002	Automated from user defined latitude / longitude center point
0x0004	Automated from user defined AOI (Area of Interest)
0x0008	Automated from pixel intelligence

Requirement	
RP 0602.3-12	A “NEW”, “MODIFY”, or “STATUS” event message shall include the MIME Media Type, the MIME Data, the Modification History, the X Location, the Y Location and the Z-Order.
RP 0602.3-13	A “MOVE” event message shall include the X Location, Y Location and Z-Order.
RP 0602.3-14	A “DELETE” event message shall include the Modification History Element.
RP 0602.3-15	An Annotation Source key shall be present during a “NEW” event.
RP 0602.3-16	An Annotation Source key shall be present during a “STATUS” event.
RP 0602.3-17	To support random access, at least one “STATUS” or “MODIFY” event shall be provided for each annotation object, at least once every five seconds.

For a given annotation object, as identified by the Locally Unique Identifier, if no event message for that object is received for a period of 20 seconds, an implementation may consider the annotation object deleted.

6.3.6 Z-Order

The Z-Order defines the order in which annotations are rendered. In any given frame, annotations are rendered in order from lowest to highest Z-Order.

Requirement	
RP 0602.3-18	Annotations without a Z-Order value, such as those created based on previous versions of this document, shall be treated as having a Z-Order of zero (Z-Order = 0) for rendering purposes.

7 Video Annotation Metadata Set

Metadata Key	Name	Definition	Type	Value Length (bytes)	Value Range	Usage
06.0E.2B.34.01.01.01.01.03.01.02.01.02.00.00.00 (CRC 21119)	Byte Order	Byte order of the metadata	Int16	2	Value is fixed at 0x4D4D	See Section 6.1
06.0E.2B.34.01.01.01.01.04.01.03.02.02.00.00.00 (CRC 15893)	Active Lines per Frame	Total number of active lines rows) in a frame of an image matrix	UInt16	2		See Section 6.1
06.0E.2B.34.01.01.01.01.04.01.05.01.02.00.00.00 (CRC 23846)	Active Samples per Line	Total number of active samples (columns) in a line of an image matrix	UInt16	2		See Section 6.1
06.0E.2B.34.02.01.01.01.0E.01.03.03.01.00.00.00 (CRC 39803)	Video Annotation	Video Annotation Universal Metadata Set		Variable		All Object Messages
06.0E.2B.34.01.01.01.01.01.03.03.01.00.00.00.00 (CRC 5618)	Locally Unique Identifier	A 4-byte locally unique ID	UInt32	4		All Object Messages
06.0E.2B.34.01.01.01.01.05.01.01.02.00.00.00.00 (CRC 8174)	Event Indication	Describes the event	ISO/IEC 646[10]	1 (32 bytes max)	0x31 = NEW[2] 0x32 = MOVE 0x33 = MODIFY 0x34 = DELETE 0x35 = STATUS	All Object Messages
06.0E.2B.34.01.01.01.01.03.02.01.06.03.00.00.00 (CRC 21885)	(Media) Description	Freeform textual description (per SMPTE RP 210[8]) providing title or text description of enclosed MIME data	ISO/IEC 646[10]	Variable (127 bytes max)	Free text	NEW MODIFY STATUS
06.0E.2B.34.01.01.01.07.04.09.02.00.00.00.00.00 (CRC 7035)	MIME Media Type	MIME media type as defined by the IETF	ISO/IEC 646[10]	Variable	See Table 2	NEW MODIFY STATUS

Metadata Key	Name	Definition	Type	Value Length (bytes)	Value Range	Usage
06.0E.2B.34.01.01.01.01.0E.01.02.05.01.00.00.00 (CRC 5825)	MIME Data	MIME encoded data of annotation message	Opaque	Variable	Per ref in Table 2	NEW MODIFY STATUS
06.0E.2B.34.01.01.01.01.0E.01.02.05.02.00.00.00 (CRC 36125)	Modification History	Identification of most recent significant event's author	ISO/IEC 646[10]	Variable (127 bytes max)	Free text	NEW MODIFY DELETE STATUS
06.0E.2B.34.01.01.01.01.07.01.02.03.01.00.00.00 (CRC 33357)	X Viewport Position in Pixels	X position of an object within a viewed image	Int16	2		NEW MOVE MODIFY STATUS
06.0E.2B.34.01.01.01.01.07.01.02.03.02.00.00.00 (CRC 6545)	Y Viewport Position in Pixels	Y position of an object within a viewed image	Int16	2		NEW MOVE MODIFY STATUS
06.0E.2B.34.01.01.01.01.0E.01.02.05.03.00.00.00 (CRC 64425)	Annotation Source	Source of the specified annotation object	Int32	4		NEW STATUS
06.0E.2B.34.01.01.01.01.0E.01.02.05.06.00.00.00 (CRC 18412)	Z-Order	Number defining the drawing order of annotations in a frame	BER OID	Variable		NEW MOVE MODIFY

[2] For example, a NEW event would have a value of 0x31 (i.e. the one byte string "1"), a MOVE event would have the value 0x32 ("2"), etc.